

## NonLinear Parallel OPTimization Tool, Phase II

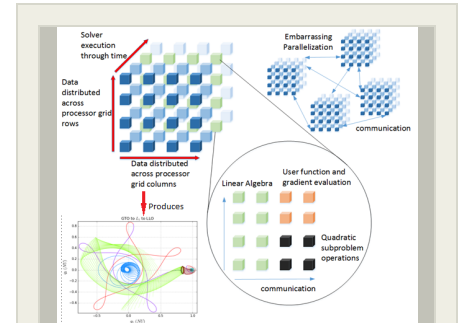
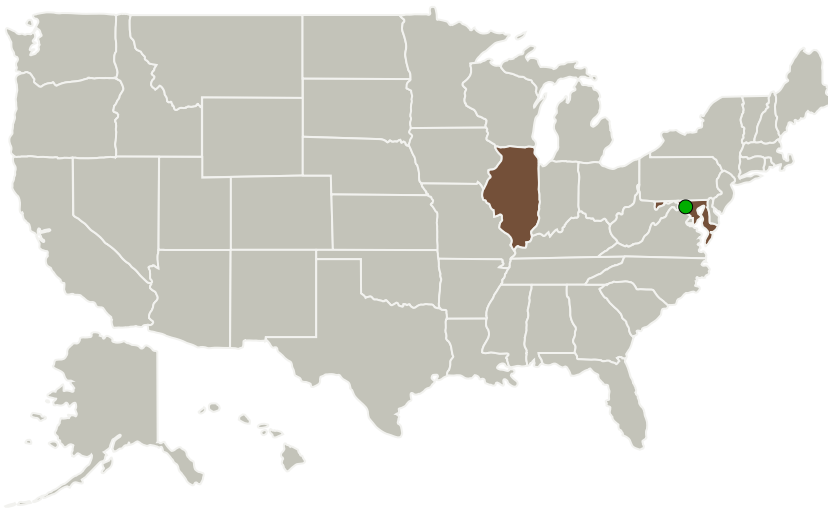
Completed Technology Project (2017 - 2020)



## Project Introduction

The technological advancement proposed is a novel large-scale Nonlinear Parallel OPTimization Tool (NLPAROPT). This software package will eliminate the computational bottleneck suffered by many standard NASA-utilized analysis tools such as GMAT, EMTG and NASTRAN. Currently these programs rely on serial nonlinear programming solvers such as the Sparse Nonlinear OPTimizer (SNOPT), despite the fact that their own codebases support full parallelization. The same is true for tools used in other industries for applications such as electric power grid optimization, nuclear reactor control and stock market analysis. The NLPAROPT algorithm can be quickly incorporated into these existing software solutions via a user-friendly interface and will offer an instant runtime reduction for very large-scale optimization problems. Irrespective of runtime gains, Phase I analysis has shown that the NLPAROPT algorithm is capable of outperforming industry standard serial solvers such as SNOPT for tested problems, including complex trajectory design problems. The Phase I effort has also identified several potential computational research avenues that, once completed in Phase II, will result in massive execution speed increases, further improving the attractiveness of this new parallel algorithm.

## Primary U.S. Work Locations and Key Partners



NonLinear Parallel OPTimization Tool, Phase II Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
CU Aerospace, LLC	Lead Organization	Industry	Champaign, Illinois
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Illinois	Maryland

## Project Transitions

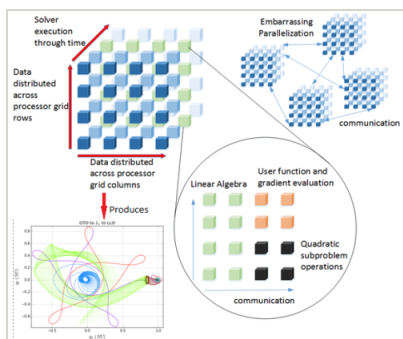
▶ **April 2017:** Project Start

✓ **January 2020:** Closed out

## Closeout Documentation:

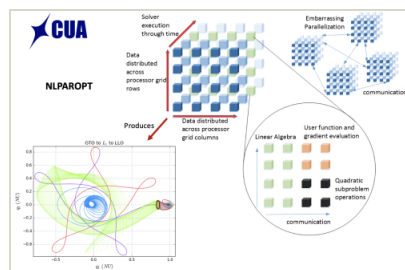
- Final Summary Chart(<https://techport.nasa.gov/file/140914>)

## Images



## Briefing Chart Image

NonLinear Parallel Optimization Tool, Phase II Briefing Chart Image (<https://techport.nasa.gov/image/136426>)



## Final Summary Chart Image

NonLinear Parallel Optimization Tool, Phase II (<https://techport.nasa.gov/image/135353>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

CU Aerospace, LLC

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

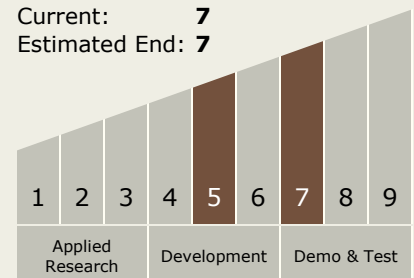
Carlos Torrez

## Principal Investigator:

Ryne Beeson

## Technology Maturity (TRL)

Start: 5  
Current: 7  
Estimated End: 7



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### Technology Areas

#### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.4 Network Provided Position, Navigation, and Timing
    - └ TX05.4.2 Revolutionary Position, Navigation, and Timing Technologies

### Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System